

REMARKS

Entry of the preceding amendment is respectfully requested. The claims have been amended to remove multiple dependencies therein. No new matter has been added.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to our Deposit Account No. 50-1145, Order No. 504270.097391.

Respectfully submitted,

A handwritten signature in cursive script, reading "Joseph C. Sullivan".

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APPENDIX:

3. (Amended) A grating as claimed in claim 2, which comprises at least 5 [or more] grating elements.

4. (Amended) A grating as claimed in claim 3, which comprises at least 20 [or more] grating elements.

5. (Amended) A grating as claimed in [any preceding] claim 1, comprising material which has no, or a negligible, real component or no, or a negligible, imaginary component.

6. (Amended) A grating as claimed in [any preceding] claim 1, in which the selected response characteristic is a spectral amplitude response and the characteristic length is a spectral amplitude cut-off wavelength.

9. (Amended) A grating as claimed in claim 7 [or 8], in which the band gap is a photonic band gap.

19. (Amended) A grating as claimed in [any preceding] claim 1, having a spectral phase response which is

linear.

20. (Amended) A grating as claimed in [any preceding] claim 1, having a spectral phase response which is nonlinear.

21. (Amended) A grating as claimed in [any preceding] claim 1, which is suitable for phase compensation.

22. (Amended) A grating as claimed in [any preceding] claim 1, which is suitable for single-frequency dispersion compensation.

23. (Amended) A grating as claimed in [any preceding] claim 1, which is suitable for a multiple-frequency dispersion compensation.

24. (Amended) A grating as claimed in claim 6, in which the spectral amplitude response comprises a combination of the response characteristics claimed in [any of claims] claim 6 [to 23].

25. (Amended) A grating as claimed in [any of claims 1 to 24,] claim 1, in which the aperiodic grating structure is 2-dimensional.

26. (Amended) A grating as claimed in [any of claims 1 to 25] claim 1, in which the aperiodic grating structure is 3-dimensional.

27. (Amended) A filter comprising a grating as claimed in [any of claims] claim 1 [to 26].

28. (Amended) A dielectric stack, comprising a grating as claimed in [any of claims 1 to 26] claim 1.

30. (Amended) A dielectric stack as claimed in [claims 28 or 29] claim 28, comprising two kinds of layers differing in refractive index.

31. (Amended) A dielectric stack as claimed in claim 28 [or 29], which comprises layers, at least three of which have refractive indices which are different from each other.

32. (Amended) An optical fibre Bragg-grating, comprising a grating as claimed in [any of claims 1 to 26] claim 1.

35. (Amended) A waveguide structure comprising a grating as claimed in [any of claims 1 to 26] claim 1.

40. (Amended) A waveguide structure as claimed in [any of claims 35 to 39] claim 35, which is a dynamic and/or reconfigurable structure, wherein the grating is arranged so that the magnitude of the relevant parameter may be altered at least one point in the grating.

43. (Amended) A waveguide structure as claimed in claim 41 [or 42], in which the effect is effected by interdigitated electrodes.

44. (Amended) A waveguide structure as claimed in claim 41 [or 42], in which the effect is effected by a comb-like electrode.

45. (Amended) A waveguide according to [any of claims 35 to 44] claim 35, in which the grating is along the length of the waveguide.

46. (Amended) A waveguide according to [any of claims 35 to 45] claim 35, in which the grating is within the waveguiding region.

47. (Amended) A waveguide structure according to [any of claims 35 to 46] claim 35, in which the waveguide [is any of the following:] chosen from the group consisting of an optical fibre, a microwave strip line, a silica on silicon planar lightwave circuit (PLC), a silicon on silica PLC, a semiconductor amplifier, and a semiconductor laser.

48. (Amended) A grating as claimed in [any of claims 1 to 26] claim 1, in which structure is in the material permittivity.

50. (Amended) A grating as claimed in [any of claims 1 to 26] claim 1, in which structure is in the material permeability.

51. (Amended) A grating as claimed in [any of claims 1 to 26] claim 1, in which structure is in the a magnetic property.

53. (Amended) An aperiodically-poled non-linear material, comprising a grating as claimed in [any of claims 1 to 26] claim 1, which is employed to quasi-phase-match light at two or more wavelengths.

54. (Amended) An aperiodically-poled non-linear material, comprising a grating as claimed in [any of claims 1 to 26] claim 1, which is employed to suppress light at one or more wavelength.

55. (Amended) A non-linear optical loop mirror including a non-linear material as claimed in claim 53 [or 54].

57. (Amended) A non-linear optical loop mirror including a grating according to [any of claims 1 to 26] claim 1.

59. (Amended) A Mach-Zehnder interferometer
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including a grating according to [any of claims 1 to 26] claim 1.

61. (Amended) A Mach-Zehnder interferometer as claimed in claim 59, including an aperiodically-poled non-linear material [as claimed in claim 53 or 54].

62. (Amended) A Mach-Zehnder interferometer as claimed in claim 59, including a waveguide structure as claimed in [any of claims 35 to 47].

63. (Amended) A Mach-Zehnder interferometer as claimed [in any of claims 59 to 62] claim 59, in which the grating is written onto an integrated-optic waveguide.

64. (Amended) A grating-assisted coupler including a grating according to [any of claims 1 to 26] claim 1.

65. (Amended) A grating-assisted coupler as claimed in claim 64 [or claim 65], which is bidirectional.

67. (Amended) A grating-assisted coupler as

claimed in [any of claims 64 to 66] claim 64, including an aperiodically-poled non-linear material as claimed in [claims 53 or 54] claim 53.

68. (Amended) A laser, including a grating according to [any of claims 1 to 26] claim 1.

72. (Amended) A laser according to [any of claims 68 to 71] claim 68, which is pulsed.

73. (amended) A laser according to [any of claims 68 to 72] claim 68, which can be modelocked.

74. (Amended) A laser according to [any of claims 68 to 73] claim 68, which is a ring laser.

75. (Amended) A laser according to [any of claims 68 to 74] claim 68, which is a semiconductor laser.

79. (Amended) A Fabry-Perot cavity, comprising at least one end mirror comprising a grating according to [any of claims 1 to 26] claim 1.

82. (Amended) A material including a grating as claimed in [any of claims 1 to 26] claim 1, in which the grating modifies an electronic bandgap structure.

83. (Amended) A material including a grating as claimed in [any of claims 1 to 26] claim 1, in which electronic potential has a variation controlling the selected response characteristic.

86. (Amended) A material as claimed in claim 84 [or claim 85], in which the scatterers are positioned at the vertices of a lattice or superlattice.

89. (Amended) A material as claimed in [any of claims 82 to 88] claim 82, in which the selected response characteristic is a band minimum.

90. (Amended) A material as claimed in [any of claims 82 to 88] claim 82, in which the selected response characteristic is an effective mass.

91. (Amended) A material as claimed in [any of claims 82 to 88] claim 82, in which the selected response characteristic is a thermal conductivity.

92. (Amended) A material as claimed in [any of claims 82 to 88] claim 82, in which the selected response characteristic is a dielectric permittivity.

93. (Amended) A material as claimed in [any of claims 82 to 88] claim 82, in which the selected response characteristic is a conductivity.

94. (Amended) A material as claimed in [any of claims 82 to 88] claim 82, in which the selected response characteristic is a magnetic permeability.

95. (Amended) A material as claimed in [any of claims 82 to 94] claim 82, which is a superconducting material.

96. (Amended) A grating as claimed in [any of claims 1 to 26] claim 1, which is in or on a nonlinear medium and which enhances a nonlinear effect.

97. (Amended) A grating as claimed in [any of claims 1 to 26] claim 1, which is in or on a nonlinear medium and in which the selected response characteristic is phase matching between at least two wavelengths and the characteristic length is an optical path length as measured in air, of $2\pi/\delta\beta$ where $\delta\beta$ is the difference between the propagation constant of two of the phase matched wavelengths.

98. (Amended) Use of a grating according to claim 96 [or claim 97], in any of the following applications: wavelength conversion, signal re-timing, signal regeneration, parametric amplification, applications involving second- and third-order nonlinear effects [(for example, second- and third-harmonic generation or the Kerr effect)], or parametric oscillators.

101. (Amended) A method as claimed in claim 99 [or 100], in which the elements of the grating are directly and individually varied.

102. (Amended) A method according to [any one of claim9 99 to 101] claim 99, in which the response

characteristic of the grating is taken during optimization to be approximately, or is derived from, the Fourier Transform of the grating arrangement during optimization.

104. (Amended) A method according to [any of claims 99 to 103] claim 99, in which the Fourier Transform of the grating arrangement is evaluated during optimization to see if, or how, it differs from the selected response characteristic.

105. (Amended) A method as claimed in [any of claims 99 to 104] claim 99, in which the optimization algorithm is simulated annealing.

106. (Amended) A method as claimed in [any of claims 99 to 105] claim 99, in which the optimization algorithm is error-diffusion.

107. (Amended) A longitudinal grating made using a method according to [any of claims 99 to 106] claim 99.

108. (Amended) A longitudinal grating which could be made using a method according to [any of claims 99 to 106] claim 99.

112. (Amended) A longitudinal grating, comprising a plurality of concatenated gratings as claimed in [any of claims 1 to 26, 48 to 52, 96 or 97 or 107 or 111] claim 1.